Grasslands Resource Conservation District

Water Management Plan

December 31st 2010
Final plan submittal date, June 2, 2011

Section A - Background

1. *Identify the staff member responsible for developing and implementing the Plan. Provide their contact information*

   Name: Michael Gardner Title: Chief of Field Operations/Water Master

   Address: 22759 South Mercey Springs Rd.

   Telephone: 209-826-5188 Fax: 209-826-4984

   E-mail mgardner@grasslandwetlands.org

2. *Year Resource Conservation District established* 1953

Define year-type used consistently throughout plan Water Year (March 1 – February 28)

3. *Water supplies*

List each annual entitlement of surface water under each water right and/or contract

Supplier	*Water source*	*Contract #*	*Contract restrictions*	*Acre-feet/year*
Federal level 2	DMC	01-WC-20-1754	Contingent on Shasta Index Trigger, 3.2 MAF, being reached	125,000
Federal level 4	DMC	01-WC-20-1754	Based on the BOR's ability to provide	55,000
State				
Appropriative				
Other, riparian				

4. *Provide a narrative on pre-CVPIA water supplies and water management*

   Prior to CVPIA, Grassland Water District contracted 53,500 acre-feet of water (Contract Nos. 14-06-200-6106, 14-06-200-4658A and 14-06-200-3447A) with Reclamation from the Central Valley Project (CVP). This water was available annually from September 15 through November 30. Along with the CVP water allocations, the District obtained contractual agreements with adjacent agricultural irrigation districts to accept drain water comprised of both surface and subsurface flows. The agricultural drain water was estimated to be 75,000 acre-feet of additional water annually. Typically the wetland waters are held until the middle of March when most landowners drawdown the wetlands. During the spring and summer months, return flows from adjacent agriculture irrigation districts supplied only enough water to provide for brood habitat and cattle pasture with a minor amount remaining to carry out the irrigation of moist soil plants. An evaluation of the District's spring and summer water supply required to optimize habitat was estimated at approximately 55,000 acre-feet and is referred to as Level 4. Fall flood up was estimated at 125,000 acre-feet, totaling a full need of 180,000 acre-feet.

In 1985, new regulatory guidelines prohibited the District from applying water containing over a 2 ppb selenium concentration monthly mean to wetlands. The new selenium regulatory guideline resulted in the loss of nearly two-thirds of the District's water supply forcing the District to begin a search to secure additional water supplies. Various programs were initiated to secure this needed water including off-stream storage projects, temporary contracts with the Bureau of Reclamation, contributions from outside entities, and groundwater acquisition projects. Even with these attempts to supplement the CVP water, the District's supplies remained inadequate to meet habitat requirements. For example, in water year 1991 the total amount of water available for delivery for the entire year was 73,500 acre feet; in water year 1992, deliveries totaled only 77,500 acre feet.

5. *Land use history--Identify habitat types specific to this Resource Conservation District.*
   Attach a map showing habitat location and size
   List habitat-types with 5% or more of total acreage

Habitat type	*Original size*	*1992 acres*	*1997 acres*	*2010 acres*
Seasonal wetland – timothy (not irrig)	NA	NA	NA	0*
Seasonal wetland – timothy (irrigated)	NA	NA	NA	30,800*
Seasonal wetland – smartweed	NA	NA	NA	1,600*
Seasonal wetland - watergrass	NA	NA	NA	3,200*
Permanent wetland	NA	NA	NA	1,200*
Semi-permanent wetland/brood pond	NA	NA	NA	1,200*
Reverse cycle wetlands	NA	NA	NA	0*
Riparian	NA	NA	NA	1,200*
Irrigated pasture	NA	NA	NA	800*
Upland	NA	NA	NA	18,000*
Upland (not irrigated)	NA	NA	NA	18,000*
Upland (managed)	NA	NA	NA	0*
Upland (grains)	NA	NA	NA	0*
Other (>5%)	NA	NA	NA	
Misc. habitat (<5%)				
Sub-total – habitat acres				58,000*
Roads, buildings, etc.				2,000*
Total (size of refuge)				60,000*

*The acres of habitat types listed above are current best estimates. A map detailing these estimates is currently unavailable. GWD, in cooperation with Ducks Unlimited and California Waterfowl Association continues to work on habitat distributions for the wetland complex. GWD supplies 192 private and public landowners. For a list of private lands and corresponding acreages see Attachment #1.

Describe Resource Conservation District habitat-type water use characteristics

Habitat type	*AF/ac*	*# of irrigations*	*Flood-up date*	*Draw-down date*
Seasonal wetland	3-6	1-4	August-September	March-May
Seasonal wetland - timothy	3	1	August-September	March-April
Seasonal wetland – watergrass	5	3-4	August-September	April-May
Permanent wetland	9	0	NA	0
Semi-permanent wetland/brood pond	8	2.5	August-September	July
Riparian	6	0	August-September	0
Irrigated pasture	NA			
Upland (not irrigated)	NA			
Upland (managed)	NA			
Upland (grains)	NA			
Other (>5%)	NA			
Misc. habitat (<5%)	NA			

Section B - Water Management Related Goals and Objectives

1. *Describe the Resource Conservation District mission relative to water management. (i.e. crop depredation, legislative mandates, service to landowners)*

   Grassland Water District/Grassland Resource Conservation District is dedicated to maintaining and operating its conveyance system for the purpose of providing its landowners and adjacent refuge areas with water available for the preservation and enhancement of wetland habitat throughout the year.

2. *Describe specific habitat management objectives. Include pertinent information from Resource Conservation District management plans*

   The District's primary habitat management objective is providing water to its landowners and adjacent refuges for the purpose of maintaining wetland habitat during the fall and winter. A co-equal objective, which is entirely dependent upon the availability of Level 4 water, is providing water for the optimum management of that habitat through the spring and summer months to provide brood habitat and maximize beneficial moist soil plant production to help meet the metabolic needs of migratory water birds.

3. *Describe the strategies used to attain objectives listed above*

The District will reserve a minimum of 70% of its water supply for achieving its primary objective of providing fall and winter waterfowl habitat. Any additional water will be reserved for the enhancement of this habitat during the spring and summer months.

4. *Describe constraints that prevent attainment of objectives and explain the effect on operations*

The lack of full acquisition of Level 4 water supplies by the Bureau of Reclamation greatly affects the District's ability to provide spring and summer water for optimum habitat management. The relatively short timeframe the District has to conduct its annual construction and maintenance will always create problems with delivery and efficiency of operations. These constraints are in part due to limitations imposed by the Endangered Species Act and the sensitive environment and strict water schedule in which the District must work within.

5. *Describe the strategies used to remedy the constraints listed above*

The Interagency Refuge Water Management Team (IRWMT), comprised of District personnel, along with representatives of the U.S Fish and Wildlife Service, the California Department of Fish and Game and Reclamation, collaborate on the scheduling of refuge water supplies and the acquisition and allocation of Level 4 water supplies. The District is a strong proponent of securing permanent water supplies in order to assure full spring and summer water supplies are available each and every year. Also, the District has been working with south of Delta agricultural districts to diversify sources of Level 2 water supplies.

Section C - Policies and Procedures

1. *Describe the Resource Conservation District policies/procedures on accepting agricultural drainage water as supply*

The District does receive a modest amount of operational spill from adjacent agricultural districts and higher quality drainage water provided that the waters meet all objectives set forth by the Central Valley Regional Water Quality Control Board for the delivery to wetlands. The District collects regular grab samples at these points of acceptance to monitor TDS, Selenium and Boron concentrations.

2. *Describe the Resource Conservation District policies/procedures on water pooling, transfers, reallocations or exchanges*

As per the GRCD water contract # 01-WC-20-1754 for pooling and transfers:

Pooling of Water Supplies:

(a) Whenever the maximum quantities of Level 2 Water Supplies and/or the Incremental Level 4 Water Supplies depicted in Exhibit "B" are reduced pursuant to Article 9 of this Contract, the remaining Level 2 Water Supplies and/or the Incremental Level 4 Water Supplies may be pooled for use on

other Refuges(s); Provided, that no individual Refuge shall receive more Level 2 Water Supplies than would have been made available to it absent a reduction pursuant to article 9 of this Contract; or be reduced by more than 25%; Provided further, that the Contracting Officer makes a written determination that pooling of water for use on other Refuge(s) would not have an adverse impact, that cannot be reasonably mitigated, on Project operations, other Project Contractors, or other Project purposes; Provided further, that the Contracting Officer determines that such reallocation is permitted under the terms and conditions of the applicable underlying water right permit and/or license; and Provided still further, that water made available under this contract may not be scheduled for delivery outside the Contractor's Boundary without prior written approval of the Contracting Officer.

(b) An Interagency Refuge Water Management Team, to be chaired by the Contracting Officer and to be established upon execution of this Contract, shall be entitled to collaboratively allocate the pooled water supplies and provide a schedule for delivery of the pooled supplies to meet the highest priority needs of the Refuge(s) as depicted in Exhibit "B"; Provided, however, nothing in this Article is intended to require the Contractor to pool the water supply provided for in this contract. The Interagency Refuge Water Management Team shall be composed of designees of the Bureau of Reclamation, the United States Fish and Wildlife Service, the California Department of Fish and Game, and the Grassland Water District.

Transfers, Reallocations or Exchanges of Water:

(a) Subject to the prior written approval of the Contracting Officer, the Project Water made available under this Contract may be transferred, reallocated or exchanged in that Year to other Refuge(s) or Project contractors is such transfer, reallocation or exchange is requested by the Contractor and is authorized by applicable Federal and California State laws, and then-current applicable guidelines or regulations.

The District is a participant in the Interagency Refuge Water Management Team (IRWMT) that coordinates the acquisition, distribution and allocation of Level-4 waters provided by Reclamation. The District encourages any and all pooling, transfers, reallocations or exchanges that will enhance or improve the delivery of water to or through our system.

3. *Describe the Resource Conservation District water accounting policies/procedures for inflow, internal flow and outflow.*

All contract water delivered to the District is monitored and measured by Reclamation or contractual agent. The District's inflow, internal flow and outflow measurements and recording procedures are established under the direction of the District's General Manager and are currently being accounted for by the District's Chief of Field Operations. All water delivery is based on a water year beginning March 1st and ending on the last day of February of the following year. Outflow is based on a seasonal event period beginning October 1 and ending on September 30 of the following year. The District, in cooperation with Reclamation, the Department of Fish and Game, and Fish and Wildlife Service, has implemented a Real-Time Water Quality Monitoring Network (RTWQMN). The RTWQMN currently consists of 43 stations located at major points of acceptance, delivery, canal system confluences, and drainages of the GRCD (See Attachment 5e – RTWQMN Map). The RTWQMN continuously monitors flow, temperature, pH and electrical conductivity (EC). Real-time water quality monitoring data is proofed on a monthly basis through a Quality Assurance Program Plan (QAPP). The QAPP includes site visitations where technicians conduct sensor maintenance, calibration, and instantaneous and redundant flow and EC measurements to insure that the data is representative and comprehensive.

4. *Attach a copy of the Resource Conservation District's shortage policies, drought plan, or any similar document.*

The District has established the following priorities (in descending order of importance) for the delivery and use of available water supplies (*See Attachment #2*)

1. Fall habitat water - August 15th to February 28th
2. Spring & summer irrigation, Brood habitat - March 1st to August 14th
3. Moist Soil Plant Management - March 1st to August 14th
4. Permanent pasture irrigation, Native pasture irrigation - March 1st to August 14th

5. *(GRCD only) Describe water policies as they pertain to:*

a. *water allocation policy to customers (Attachment #3a),*

Water is delivered to the District's landowners on a pro-rata basis determined by total available water versus the total acres being serviced. As of March 1, 2010, lands that were not wetland habitat at the time of the CVPIA passage were notified that any water they would request in the future for restored habitat would be provided only on an "in and when available " status due to restricted amounts of Level 4 water supplies. Fall habitat water is distributed to clubs from August 15th through the month of February. Customers are assessed an annual water service and standby fees that are charged on a per acre basis. Water for the optimization of wetland habitat is available for use by the clubs for spring and summer irrigation and brood habitat maintenance which are available from March 1st through August 14th. The summer water is billed out on a per acre-foot charge.

b. *lead time for water orders (Attachment #3b - sample water order form),*

The District requires its customers provide at least 72 hours in advance notification for all water orders, deliveries and shut-offs.

c. *policies for wasteful use of water (Attachment #3a)*

The District will notify individual clubs that they are in violation of water conservation policies and request the violations be corrected. If no action is taken, the District will terminate any District controlled deliveries until the situation is corrected. The District may refuse water delivery to any club that does not properly maintain its water conveyance system or water conveyance structures.

d. *pricing and billing policies (Attachment #4a, 4b - sample bills)*

The District has two separate charges for water delivery to clubs within the District boundary. Fall habitat water, delivered from August 15th through the end of February, is billed on a per acre basis. These charges cover all water needed to fill and maintain the wetland habitat within each individual hunting club. Spring and summer irrigation water, delivered from March 1st through August 14th, is provided to the clubs for irrigation and brood habitat maintenance and is billed on a per acre-foot basis.

Fixed Charges			
Charges ($ unit)	*Charge units ($/acre), ($/customer) etc.*	*Units billed during year (acres, customer) etc.*	*$ collected ($ times units)*
$21.75	$21.75/Acre	Acres	1,113,604

Volumetric charges			
Charges ($ unit)	*Charge units ($/AF), ($/HCF), etc.*	*Units billed during year (AF, HCF) etc.*	*$ collected ($ times units)*
$4.00	$4.00/AF	AF	104,000

Section D - Inventory of Existing Facilities

1. *Mapping*

   Attach existing facilities map(s) that show points of delivery, turnouts (internal flow), and outflow (spill) points, measurement locations, conveyance system, storage facilities, operational loss recovery system, wells, and water quality monitoring locations. Describe in the body of the plan the information contained in each attached map. (*See Attachment #5a-5d*)

   Attachment 4 is a series of Maps including an ownership map and all major canal systems. A second map has been provided that identifies points of delivery and points of measurement. Additionally a map of the Real Time Water Quality Monitoring Network has been provided that currently consists of 43 stations located at major points of acceptance, delivery, canal system confluences, and drainages of the GRCD (*See Attachment #5e*).

2. *Water measurement*

   a. *Inflow/deliveries*

   Total # of inflow locations/points of delivery 37

   Total # of measured points of delivery 37

   Percentage of total inflow (volume) measured during report year 100

Delivering agency	Conveyance facility	*Measuring point*	*Resource Conservation District distribution facility*	*% of total inflow*	*Type of measurement*	*Measuring agency*
1-CCID	Helm 1st Point	Helm 1st Point	Helm Canal	1	Rated canal gate	CCID
2-CCID	Main Canal	Agatha gate	Agatha Canal	15	Rated canal gate	CCID
3-CCID	Main Canal	Coaches gate	Helm Canal	3	Rated canal gate	CCID
4-CCID	Main Canal	Frog Pond gt.	Helm Canal	1>	Rated canal gate	CCID
5-CCID	Main Canal	Meyers gate	Helm Canal	2	Rated canal gate	CCID
6-CCID	Main Canal	Vista gate	Helm Canal	1	Rated canal gate	CCID
7-CCID	Main Canal	Ram gate	Ram Ranch	1>	Rated canal gate	CCID
8-CCID	Main Canal	Camp-13 gate	Camp-13	11	Rated canal gate	CCID
9-CCID	Main Canal	Bayshore gate	Bayshore	1>	Rated canal gate	CCID
10-CCID	Main Canal	Triangle gate	Triangle	1>	Rated canal gate	CCID
11-CCID	Main Canal	Ascot gate	Ascot Ditch	1	Rated canal gate	CCID
12-CCID	Main Canal	Almond gate	Almond Drive	8	Rated canal gate	CCID
13-CCID	Main Canal	Costa gate	Costa	1>	Rated canal gate	CCID
14-CCID	Main Canal	SL gate	San Luis Canal	17	Rated canal gate	CCID
15-CCID	Main Canal	LBCr. gate	Los Banos Creek	1	Rated canal gate	CCID
16-CCID	Main Canal	Sloan gate	Sloan	1>	Rated canal gate	CCID
17-SLDMWA	Volta Wasteway	Pond 10	Cross Channel	10	Rated canal gate	SLDMWA
18-SLDMWA	Volta Wasteway	Pond 10	Mosquito Ditch	6	Rated canal gate	SLDMWA
19-SLDMWA	Volta Wasteway	Pond 10	Malia Ditch	2	Rated canal gate	SLDMWA
20-CCID	Main Canal	Cottonwood Lateral gate	Cottonwood Lateral	1>	Rated canal gate	CCID
21-CCID	Main Canal	Hunt Road	Garzas Creek	9	Rated drop structure	CCID
22-CCID	Outside Canal	Cook gate	Charleston Drain	1>	Rated canal gate	CCID
23-CCID	Helm 1st Point	Gables gate	Gables Ditch	1	Rated canal gate	CCID
24-CCID	Helm 1st Point	Roberts gate	Roberts gate	1>	Rated canal gate	CCID
25-CCID	Branch-3	Branch-3	Bennett Drain	1>	Rated canal gate	CCID
26-SLCC	Arroya Canal	Fagundes gate	Fagundes	1>	Rated canal gate	SLCC
27-SLCC	Arroya Canal	La Canada gt.	La Canada	1>	Rated canal gate	SLCC
28-SLCC	Arroya Canal	Piedmont gate	Piedmont	1>	Rated canal gate	SLCC
29-SLCC	Arroya Cana	San Pedro gt.	San Pedro	1>	Rated canal gate	SLCC
30-SLCC	Arroya Cana	Bardin gate	Bardin	1>	Rated canal gate	SLCC
31-SLCC	San Pedro Canal	Bardin gate	Bardin	1>	Rated canal gate	SLCC
32-SLCC	San Pedro Canal	San Pedro gt.	San Pedro	1>	Rated canal gate	SLCC
33-SLCC	San Pedro Canal	Stevens Creek Quarry gate	Stevens Creek Quarry	1>	Rated canal gate	SLCC
34-SLCC	San Pedro Canal	Klamath gate	Klamath	1>	Rated canal gate	SLCC
35-SLCC	San Pedro Canal	Tramontana gt	Tramontana	1>	Rated canal gate	SLCC
36-SLCC	San Pedro Canal	McDonald gt.	McDonald	1>	Rated canal gate	SLCC
37-SLCC	Arroya Canal	Cocke Ditch gate	Mud Slough Unit (CDF&G)	1	Rated canal gate	SLCC

b. Internal flow at turnouts

Total # of Resource Conservation District water management units (units) 192
Total # of Resource Conservation District water management unit turnouts 230
Total # of Resource Conservation District measured turnouts 225
Estimated % of total internal flow (volume) during report year that was measured at a turnout 98%
Number of turnouts supplying more than one unit or not directly off delivery system 5

Measurement type	*Number of devices*	*Acres served*	*Accuracy (avg or range)*	*Reading frequency*	*Calibration frequency (months)*	*Maintenance frequency (months/days)*
Orifices	212		+/- 12%	Daily	Annually	NA
Propeller						
Weirs	15		+/- 18%	Daily	NA	NA
Flumes						
Venturi						
Alfalfa valves						
Metered gates						
Other, Doppler	3		+/- 5%	Continuous	Monthly	Monthly

* The weirs are canal internal flow water-control devices

c. Outflow

Outflow (AF/yr) 48,408
Total # of outflow locations/points of spill 8
Total # of measured outflow points 8
Percentage of total outflow (volume) measured during report year 100%

Outflow point	*Measuring point*	*Type of measurement*	*Percent of total outflow (estimated)*	*Measuring agency*	*Acres drained*
DS-31	Los Banos Creek @ Hwy. 140	Doppler Measurement	20	GWD	8,113
DS-32	City Gates	Rated Canal Gate Measurement	16	GWD	Emergency drain
DS-33	Santa Fe Canal Bypass	Weir Measurement	7	GWD	Emergency drain
DS-34	S-Lake Drain	Doppler Measurement	8	GWD	3,802
DS-35	Hollow Tree Drain	Doppler Measurement	11	GWD	2,833
SD-36	Santa Fe Canal (Skeleton Weir)	Weir Measurement	17	GWD	3,190
SD-37	Mud Slough Gun Club Rd.	Doppler Measurement	21	GWD	8,178
DS-38	Fremont Drain	Doppler Measurement	NA	GWD	1,996

3. *Identify the type and length of the Resource Conservation District internal distribution system*

Miles unlined canal	*Miles lined canal*	*Miles piped*	*Miles – other*
135	0	0	0

a. *Describe the location and types of identified leaks and areas of higher than average canal seepage, and any relation to soil type*

It is the intent of the District to further evaluate seepage and evaporation related losses within its conveyance system. Estimates provided in Table 2 are based on approximations made by District staff and should not be used for any other purpose.

A 1.5 mile section of the Kesterson Ditch, which crosses the old historic Mud Slough (North) channel, is subject to higher than normal seepage losses due to the large concentrations of Turlock Sandy Loam soils that reside in the area. There appears to be cross stratums of deeper, more porous sandy loam that intersects the ditch in areas. No plans have been developed to try to correct the situation because of the cost involved. The ditch has a maximum flow capacity of 45 cfs and is used mostly in the fall and spring. After fall deliveries, the surrounding areas become saturated and losses become minimal. Spring irrigations are done quickly to reduce operation times.

4. *Describe the Resource Conservation District's operational loss recovery system*

Initiated in 1996, the Grassland Bypass Project consolidates subsurface drain water from the 97,000 acre Grassland Drainage Area into the San Luis Drain effectively circumventing the wetland complex serviced by the Grassland Water District. Since the Grassland Bypass Project the District has been able to recapture its entire operational spill and return flows from the South Grassland area (20,538 acres) for the reuse in the North Grassland area.

Although there are currently no recover systems in place to move water back upstream in the North Grasslands area, operational spill leaving impoundments do re-enter conveyance for delivery downstream. All discharges leaving the District enter natural riparian areas and therefore are beneficial since the natural flow of most of these streams and tributaries have been diverted by upstream water projects. Seven of the 8-discharge sites flow directly into State or Federal Refuges. The District has recently entered a cooperative agreement with Reclamation to initiate a feasibility study for a proposed water conservation and water quality control project to be located on the northern portion of the District. Based on the findings of the project feasibility assessment report the District will work with Reclamation to develop additional funding to implement this project. This project could result in the reuse of approximately 8,000 acre feet of water annually.

Pump #	Location	HP
NA		

5. *Groundwater*

Describe groundwater availability, quality and potential for use

The District is currently in a three year pilot project in conjunction with USBR to assess the feasibility of using groundwater from several existing wells to augment currently available Incremental Level 4 supplies. For additional information on groundwater in the region, see USBR July 2004 "Evaluation of Groundwater Potential for Incremental Level 4 Refuge Water Supply". Current groundwater availability is limited due to funding and water quality constraints. The quality of the districts groundwater highly variable, with TDS levels ranging from approximately 790-1630, as observed in the wells under current agreement with Reclamation.

Groundwater plan *No* ___X____ *Yes* _____*(attached or web link provided).*

Groundwater basin(s) that underlie the Resource Conservation District

The District is currently developing a Groundwater Management Plan and hopes to have it competed in the 2011 water year.

Name of basin underlying Resource Conservation District	*Size (sq. mi.)*	*Usable capacity (AF)*	*Safe yield (AF/Y)*	*Management agency*	*Relevant reports*
San Joaquin	13,500	80,000,000	Unknown	None	USBR 2004 GW

Identify Resource Conservation District -operated ground water wells

#	*Location*	*Status*	*HP*	*2010 (AFY)*	*Future plans*
1	37 00'37.77N 120 47'58.91W	Operational	30	2,100	Continue to utilize
3	37 10'55.79N 120 83'94.15W	Operational	100	1,500	Continue to utilize
4	37 10'982.30N 120 83'94.15W	Operational	60	1,500	Continue to utilize
5	37 06'51.58N 120 50'37.64W	Operational	60	1,500	Continue to utilize

Section E - Environmental Characteristics

1. *Topography - describe and discuss impact on water management*

The topography in this region was created by natural flows from the floodwaters of the San Joaquin River. In the late 1800's cattle became the primary source of income from the land with duck hunting as a secondary activity. In the 1920's duck hunting began to become more prevalent and by the 1950's duck hunting became the predominant use of the land. Clubs began to develop shallow open water to attract wintering waterfowl. Currently there are 188 individual clubs that rely on gravity flow water to operate and maintain year-round wetland habitat for wildlife. There is 65 feet of elevation fall from the southern boundary of the District to the northern boundary, an approximate distance of 26.6 miles. The

District still relies on canals that were built in the late 1800's and are quite efficient. The District is entirely gravity flow with central, natural sloughs flowing through the District to provide drainage.

2. *Soils - describe and discuss impact on water management* (See Attachment #6a-6c Soil Survey Maps)

The Northern portion of the District is predominantly made up of Turlock sandy loam. This very deep, very poorly drained soil is on the valley basin rim and on low alluvial fans. It formed in mixed alluvium derived dominantly from granitic rock. Slope is 0 to 2 percent. The micro-relief is hummocky. The characteristic plant community is mainly saltgrass, annual barley, and iodine bush. Elevation is 70 to 110 feet. Typically, the surface layer is grayish brown sandy loam about 3 inches thick. The subsurface layer is olive gray loam about 1 inch thick. The soil is calcareous below a depth of 25 inches, and it has excess lime below a depth of 36 inches. The soil is saline-sodic below a depth of 11 inches.

Mixed throughout this Turlock sandy loam is Triangle clay. This is a very deep, very poorly drained soil within the basin. It formed in mixed alluvium derived dominantly from sedimentary rock. Slope is 0 to 2 percent. The characteristic plant community is mainly swampgrass and alkali heath. Elevation is 80 to 120 feet.

Also found in the north Grasslands is Triangle clay. This very deep, very poorly drained soil is in the valley basin. It formed in mixed alluvium derived dominantly from granitic rock. Slope is 0 to 2 percent. The characteristic plant community is mainly alkali heath, swamp grass, knot grass, spike rush, and iodine bush. Elevation is 70 to 110 feet. Typically the surface layer is olive gray and dark gray clay about 34 inches thick.

Moving southward, north of Los Banos, the general soil makeup is Turmound sandy loam. This very deep, poorly drained soil is in higher lying, ponded areas of the valley basin. It formed in mixed alluvium derived dominantly from granitic rock. Slope is 0 to 2 percent. The characteristic plant community is mainly saltgrass, Baltic rush, rabbitfootgrass, and iodinebush. Elevation is 70 to 80 feet. Typically the surface layer is dark grey over gray sandy loam about 13 inches thick. Included in this unit are small areas of Triangle clay and Turlock sandy loam in the higher lying areas.

Areas south of Los Banos are made up of Checker loam. This very deep, somewhat poorly drained soil is in higher lying, ponded areas in the valley basin. It formed in mixed alluvium derived dominantly from sedimentary rock. Slope is 0 to 2 percent. The characteristic plant community is mainly saltgrass, Spanish broam, Mediterranean barley, and alkali heath. Elevation is 100 to 110 feet. Typically, the upper 4 inches of the surface layer is grayish brown loam.

Directly east and southeast of Los Banos the soils are mixed with Agnal clay loam and ElNido sandy loam, wet. The Agnal clay loam is very deep, very poorly drained soil in the valley basin. It formed in mixed alluvium derived from Igneous and/or sedimentary rock mixed alluvium. Slope is 0 to 2 percent. The characteristic plant community is mainly saltgrass, iodinebush, and alkali heath. Elevation is 60 to 110 feet. Typically, the upper 2 inches of the surface layer is gray clay loam and the lower 7 inches is dark gray clay. The ElNido sandy loam, wet, is very deep, poorly drained soil in higher lying, ponded areas in the valley basin. It formed in mixed alluvium derived dominantly from granitic rock. Slope is 0 to 2 percent. The characteristic plant community is mainly saltgrass, barley, and alkali sacaton. Elevation is 75 to 110 feet. Included in this unit are small areas of Bolfar clay loam, hummocky, and Dos Palos clay ("Soil Survey of Merced County, CA, Western Part", USDA, Soil Conservation Service – Issued March 1990).

The habitat diversity coupled with and responding to the varieties of soils found within the grassland area imposes challenges in water management. Sandy soils, like the Turlock sandy loam, that is predominant in the northern portion of the District, can cause the greatest amount of seepage losses. The historic delivery of irrigation water imported large deposits of silt that has help seal canals and reduce seepage in District facilities. No attempts have been made to line District facilities since natural earthen channels are more favorable to wildlife and shallow groundwater recharge. Once groundwater saturation is reached, usually occurring in late November through March of the following year, seepage losses are minimal.

Soil Series Name	**Soil Classification**	**Parent Material**
Agnal	Fine, smectitic, thermic Typic Aquisalids	Igneous and/or sedimentary rock mixed alluvium
Bolfar	Fine-loamy, mixed, superactive, calcareous, thermic Cumulic Endoaquolls	Granitic mixed alluvium
Checker	Fine-loamy, mixed, active, thermic Calcic Aquisalids	Sedimentary rock mixed alluvium
Dos Palos clay	Fine, smectitic,calcareous, thermic Vertic Endoaquoll	Granitic mixed alluvium
El Nido	Coarse-loamy, mixed, superactive, thermic Typic Endoaquolls	Granitic mixed alluvium
Tirangle clay	Fine, smectitic, thermic Sodic Epiaquert	Granitic mixed alluvium
Turlock sandy loam	Fine-loamy, mixed, superactive, thermic Albic Natraqualfs	Sedimentary rock mixed alluvium
Turmound	Fine-loamy, mixed, superactive, thermic Glossic Natraqualfs	Granitic mixed alluvium

Soil Series Name	**K_{sat}**	**$CaCO^3$**	**EC_e**	**SAR**	**pH**	**AWC**	**Depth to water table**
	(in/hr)	**(max)**	**dS/m**	**(max)**		**(in)**	**(ft)**
Agnal clay loam	0.00 - 0.06	3%	16.0 - 99.0	300	8.0 - 8.8	2.4	0
Bolfar	0.20 - 0.57	5%	0.0 - 8.0	-	8.0	8.6	3.0 - 5.0
Checker loam	0.06 - 0.20	40%	10.0 - 100.0	60	8.0 - 8.5	3.1	3.0 - 4.0
Dos Palos clay loam	0.06 - 0.20	15%	2.0 - 16.0	-	8.0	9.5	3.0 - 5.0
El Nido sandy loam	1.98 - 5.95	0	0.0 - 2.0	-	8.0 - 8.3	6.6	3.5
Tirangle clay	0.00 - 0.06	10%	1.0 - 16.0	30	8.0 - 9.2	5.4 - 6.8	-
Turlock sandy loam	0.00 - 0.06	15%	15.0 - 35.0	35	7.4 - 8.6	4.4	-
Turmound sandy loam	0.06 - 0.20	5%	8.0 - 16.0	45	8.0 - 8.5	4.5	1.5 - 2.5

3. Climate

Western Regional Climate Center, Los Banos, Ca. (045118)

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Annual*
avg precip-1	1.93	1.97	1.65	0.63	0.44	0.07	0.04	0.05	0.28	0.56	1.11	1.22	9.95
avg. temp-1	45.9	51.5	55.7	60.6	67.2	73.4	78.1	77.1	73.1	65.1	53.4	45.3	62.2
max temp-1	54.9	62.4	67.5	74.1	81.6	89.0	94.6	93.5	88.8	79.6	65.3	55.1	75.5
min temp-1	36.8	40.5	43.9	47.0	52.7	57.7	61.5	60.6	57.3	50.6	41.4	35.4	48.8
ET_{O-2}	1.08	1.98	3.95	5.61	7.84	8.53	8.30	7.24	5.65	3.93	1.75	1.18	57.05

1=Weather Station ID: WRCC Los Banos. Date Period: 1970 to 2000

2=Weather Station ID: CIMIS Panoche. Date Period: 1996 to 2006

Discuss the impact of climate, and any microclimates, on water management

During the high ET_O observed in the summer and early fall months the wetlands require a much higher rate of water application relative to the same areas flooded and maintained over the winter. Additionally, northern prevailing winds high winds and winds out of the Pacheco Pass raise ET_O during the spring months. Summer water ponds are maintained at depths to prevent unwanted vegetation from invading the wetlands. Ponds flooded at shallower depths must be disked on an annual basis and kept dry every other year to control invasive vegetation. The southern portion of the district experiences less precipitation during rain events relative to the north grasslands due to the rain shadow of the cost range. Water managers account for these differences in precipitation and make adjustments in the conveyance and pond levels accordingly.

4. *Water quality monitoring (attach water quality test result forms #7)*
   If the refuge has a water quality monitoring program complete this table

Analyses performed	*Frequency range*	*Concentration range*	*Average (mean)*
EC (dS/m)	Monthly	220 - 2400	995
TDS (ppm)	Monthly	130 - 1500	582
Boron (ppm)	Monthly	0.14 – 5.4	2.83
Selenium (ppb)	Monthly	0 – 5.1	1.12

Discuss the impact of water quality on water management

The major water quality constituents of concern in the GRCD include selenium, boron, and salt. In the current Basin Plan, the Regional Water Quality Control Board objective for selenium in the Grassland Watershed Wetland Channels is 2 ppb (monthly mean). Since CVPIA, TDS levels of the District's fall and winter water supply have ranged from 130 ppm to 1500 ppm with a mean of 582 ppm. The elevated TDS levels usually occur during summer months at a time when there is minimal flow moving through the District's conveyance.

Although the Grassland Bypass Project removed the majority of drain water flows from the wetland water supply channels, the District does receive operational spill from adjacent irrigation districts. These additional flows are of good quality and do not exceed RWQCB water quality objectives.

The RWQCB's selenium 2 ppb monthly mean objective has seldom been observed through instantaneous grab sampling within the District's conveyance at times of limited or no flow or during extremely heavy rain events. During times of limited to no flow selenium enriched shallow ground water can accrete into the unlined canal system. Once the conveyance is charged, selenium concentrations fall below the regional board objective monthly objective of 2 ppb. The District's ability to utilize fresh water dilution flows is an integral component in meeting the RWQCB water quality objectives.

Occasionally selenium and salt enriched flood waters from Grassland Area discharges (GDA) exceed the capacity of the San Luis Drain (SLD) forcing the GDA to utilize the GWD's conveyance for flood control to prevent selenium enriched sediment disturbance in the SLD. Since the implementation of the Grassland Bypass Project (GBP), there have been three years where the GBP has reached its maximum capacity and the remaining flood waters beyond the GBP maximum capacity were required to be routed through the District's conveyance. During these instances, all District deliveries were terminated and

subsequently required the District's canal system to be flushed with CVP delivery water prior to reestablishing deliveries. The flushing usually requires 100 to 200 acre-feet of water to recharge and clean the system.

Selenium and boron concentrations are relatively low during the fall and winter months when District deliveries are substantial enough to provide adequate dilution flow preventing shallow ground water from accreting into the conveyance. During spring and summer months, when deliveries are at a minimum, the District can observe elevated EC measurements, however salt load leaving the district during this time is minimal because of the low volume of water being discharged. Drainage water from the District's lands during spring draw down can at times also have elevated EC although recent monitoring indicates the majority of salt load leaving the district occurs during winter storm events. During winter months, operational spill from wetland units is often routed into the delivery conveyance and diluted with fresh water improving the quality in the conveyance and discharges leaving the district.

State and Federal regulations and legislation, such as HR 2828, may have long lasting impacts on the District's future water management practices. In light of this, the District has developed a Real-Time Water Quality Monitoring Network (RTWQMN) adding a key tool aiding in Decision Support to optimize water quality management and water conservation. The District's RTWQMN monitors flow and water quality at 43 key supplies, inter-conveyance, and drains throughout the district. The Network is also monitoring six swamp timothy managed ponds on both federal and privates lands in hopes of creating a mass balance of salts and water entering and leaving the impoundments. This Network, pending RWQCB approval, would allow for the utilization of the Real Time Salt Load Allocation as identified in the RWQCB's Salt and Boron TMDL.

Diversification of the District's Level 2 and development of Incremental Level 4 supply could also have an impact on water quality management within our area. Groundwater pumping is being looked at as a possible means of providing needed Incremental Level 4 by diversifying the District's Level-2 which benefits both CVP South of Delta Ag Contractors and refuges. Groundwater can contain higher concentrations of salts than project water during certain times of the year. Lower EC project water during times of moderate to high flow can be used to minimize surface water degradation. Conversely the District has observed higher salt concentrations in the surface water than ground water during low flow conditions, due to shallow ground water infiltration into the conveyance. During these low flow conditions deep ground water production has the potential to improve water quality by diluting salts and other constituents.

The District contracts with the Bureau of Reclamation for the delivery of water to both State and Federal wildlife refuges. This contract requires the District to insure the best quality water that it can provide.

Section F - Transfers, Exchanges and Trades

Provide information on any transfers, exchanges and/or trades into or out of the Resource Conservation District

From whom	To whom	Report year (AF)	Use
None			
	TOTAL		

Section G - Water Inventory

See Attached Tables

Section H - Critical Best Management Practices

Describe the 5-year implementation plan and the proposed 3-year funding budget.

1. *Management programs*

   a. *Education*

Program	*Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
Landowners meeting (information)	5	5	5
Grassland Environmental Education Center	100	100	100
District Newsletter	19	20	20

Describe the specifics of each program (number of participants, topics, purpose, etc.) and attach program materials, if available.

The District conducts an annual Landowner's Meeting in the spring of each year for the purpose of informing its customers about current issues. Presentations cover a wide range of topics from current and pending legislation to water quality issues and wetland management. Water conservation techniques are often presented to the landowners with the purpose of encouraging them to employ best water management practices and to introduce them to new products and ideas designed to improve water deliveries and water use efficiency. Attendance may range from 80 to 150 landowners and concerned individuals (See Attachment#8 2010 Land Owner Meeting Agenda).

In conjunction with the Department of Fish and Game, the District sponsors the Grassland Environmental Education Center (GEECe) for the purpose of educating elementary school students and others about the benefits of wetlands and the valuable role that agriculture can play in the conservation of wildlife habitat. Each year approximately 6,480 students and around 2,500 adults are given a hands-on introduction to wildlife and wetland habitat. The District and DFG jointly fund a full-time interpreter to coordinate and conduct education classes at a designated wetland site (See Attachment #9 GEECe Program Flier).

The District publishes a newsletter designed to update and inform its landowners and others on current water situations and other important issues. Topics range from current water status to legislative updates. Other topics include conservations programs, wetland enhancement programs, water quality regulation, water quality monitoring, and other wetland water issues (See Attachment #10 Grassland Explorer Newsletter).

   b. *Water quality monitoring*

Type of water	*Existing Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
Surface – USBR and riparian	600	600	600
Upslope drain	5	5	5
Groundwater	20	20	20
Outflow	50	50	50

Short description of existing or planned program – i.e., required by which agency, coordinated with whom, constituents monitored and frequency.

Since the mid 1980's the District has collected and recorded water quality data on surface inflows and drainage leaving the District. Inflow sites continue to be monitored throughout each water year for TDS, EC, boron and selenium. The grab sampling occurs on a monthly basis at major drainages and at delivery locations to State and Federal Refuges temporarily coinciding with the monthly Irrigated Lands Regulatory Program Ag Waiver sampling efforts. The Department of Fish and Game (DFG) conducts and shares weekly EC measurements from 19 supply and drainage locations to the Los Banos Wildlife Area and Volta Wildlife Area. Additionally DFG collects ground water elevation data from monitoring wells on a weekly basis on the Mud Slough Unit of the Los Banos Wildlife Management Area. The District's Real-Time Water Quality Monitoring Network consists of 43 monitoring stations located at key inflow, delivery and drainages continuously measuring flow, EC, temp, and pH (See Attachment #5e).

c. Cooperative efforts

The District, in cooperation with the State Water Resource Control Board, CALFED Bay Delta ERP, the California Department of Fish and Game, the Department of Water Resources, UC Davis, and UC Merced investigated Wetland Responses to Adaptive Salinity Drainage Management. The proposed modified hydrology delayed the drainage from the wetland complex to match the assimilative capacity in the San Joaquin River during the flow releases of the Vernalis Adaptive Management Program. This investigation found significant degradation in both seed and biomass production in response to a proposed delayed draw down of seasonal wetlands due to less than optimal germination temps and a shortened growing season. Furthermore the delayed drainage hydrology required significantly more water to maintain the ponds and cause water quality and soil degradation.

Additionally, the district is currently in a cooperative agreement with, in cooperation with the DFG and the U.S. Fish and Wildlife Service to further characterize flow and water quality entering, conveyed within, and leaving the wetland complex. Preliminary finding indicate that the majority of salt loading to the river from the wetland complex is associated with winter storm events and not wetland draw down. The Real Time Water Quality Network and the aforementioned flow and water quality assessment has fostered the development of a Decision Support System allowing water and wetland mangers to maximize water quality through the mixing of flows from drainage subareas of variable water quality and with CVP supplies.

The District is a participant in the Westside San Joaquin River Watershed Coalition's program to implement the requirements of the Central Valley Regional Water Quality Control Board's Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands. Additionally, the District contributes a semi-annual water quality report to the State Board characterizing flow and salt load at the major drainages leaving the district.

The District also participates in other cooperative efforts with numerous agencies to promote more efficient and effective wetland and water management practices. For additional information see Section 1.f. below.

d. Pump evaluations (mobile labs)

Total number of groundwater pumps on Resource Conservation District _____4_____
Total number of surface water (low-lift) pumps on Resource Conservation District ___None___

Groundwater pumps	*Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
# of groundwater pumps tested	NA		
# of pumps to be fixed or replaced	NA		
# of low-lift pumps to be tested	NA		
# of pumps to be fixed or replaced	NA		

e. Policy evaluation

The District's Board of Directors has formed a Water Management Committee to review and update the District's water conservation policies. This committee reports monthly to the Board of Directors, at their regularly scheduled meeting, and may present proposed modifications or additions to the existing policies for consideration or adoption by the Board.

The ability of districts and refuges to share or transfer waters among agencies would be very valuable. If agricultural districts could trade and transfer water with refuge supplies, without undue paperwork, there could be huge savings in overall water use. Carryover water could be used by Ag and returned at a more desirable time for wetlands.

f. (GRCD only) *Provide Customer Services - Facilitate physical/structural improvements for member units; provide management services and technical advice to raise funds for BMP Implementation and provide customers with water efficiency education programs.*

Service	Number of units needing assistance	Number of units to be assisted yearly	Proposed schedule	Estimated cost
Facilitate physical /structural improvements for member units	5% to 7.5%	8 to 12	None	Billed to customer
Provide management services, technical advice	5% to 7.5%	8 to 12	None	Approx. 20 hrs. staff time
Facilitate fundraising	5%	8	None	10 hrs

The District cooperates with wetland related organizations that provide direct services to its customers. These services include installation of water control structures, development of drainage swales, habitat improvements, water efficiency improvements and water management techniques. Organizations that assist landowners include Ducks Unlimited, California Waterfowl Association, Natural Resource Conservation Service, Wildlife Conservation Board, U.S. Fish and Wildlife Service and California Department of Fish and Game. These agencies are instrumental in writing grants for wetland habitat improvements.

2. (GRCD only) Pricing structure

The District has established current pricing on its spring and summer water deliveries on a per acre-foot basis. This water may also be referred to as optimum habitat water (Level-4). The present rate is set to encourage the use of the water since the ultimate goal is to produce the best quality habitat for brooding and wintering waterfowl. The water delivered for fall habitat (Level-2) is charged on a per acre basis and is designed to promote the full usage of this water for the benefit of the resource (See Attachments 4a, 4b- Sample Water Bill).

3. (GRCD only) Plan to measure deliveries

The District has installed 43 Real-Time Water Quality Monitoring Stations including flow measurement devices within the past 5 years and is presently evaluating their performance for effectiveness and dependability. Depending on funding, immediate expansion of the RTWQM Network is planned at 6 key locations on the Santa Fe Canal, Garzas Creek and Mosquito Ditch. The Skeleton Weir located at the terminus of the Santa Fe Canal and is a key site for characterizing conveyance spill and delivery decision support on the Santa Fe system. The Garzas Creek proposed monitoring station is a major supply to North Grassland wetland habitats from Central California Irrigation District. The Santa Fe Canal @ Hwy 165 monitoring station would quantify flow and salt load downstream of the San Luis Canal/ Santa Fe Canal confluence, a key drainage and delivery location in the GWD. The Santa Fe Canal downstream of the Volta Wasteway Cross Channel confluence monitoring station would characterize blended water quality from both supplies as well as contributions of Los Banos Creek. The Mosquito Ditch head at Volta Wildlife Area Pond 10 is a major delivery location from the San Luis Delta Mendota Water Authority to GWD. The South Grassland Temporary Holding Reservoir would receive water from either the Santa Fe Canal or the Agatha Canal Extension.

The District has developed a personal data assistant (PDA) with the ability to run “submerged orifice” water formulas. The program is derived from “Brater & King, Handbook of Hydraulics”. District water tenders will measure the head differential between upstream and downstream and calculate a daily average flow for the customer. Staff gauges are presently used throughout the district to keep track of water surface elevations for the purpose of consistency and accuracy.

The District has also developed a customer delivery system that will catalog all customer delivery gates, by number, and account for all water delivered. Each delivery system will contain all pertinent information needed for an accurate measurement. Gate size, pipe length, roughness coefficient and acreage will be included in the program. To compliment this program and to improve on the accuracy, the District will be evaluating its delivery system to establish which areas can be improved by the installation of water elevation sensors. These sensors will improve the recording of accuracy levels and should result in a +/- 6% targeted result.

Along with this measurement system, the District is in the process of identifying and calculating the actual acreage serviced by each individual customer turnout. This will allow the water tenders to better estimate water needs and thus reduce the possibility of over-watering areas. This will also help in determining a proper amount of maintenance water that will be needed during the late fall and wintering season.

The recording of data involved in the water delivery system will ultimately go to benefit the overall water efficiency of the District. The additional data such as acres served and projected water requirements will be at the water tender’s fingertips, readily accessible through the use of the PDAs.

The District is always exploring new innovations in water measurement to see if they can be adapted into the District's delivery system.

Location	*Measurement devices to be installed*	*Accuracy*	*Estimated Cost*	*Planned installation date*				
				2011	*2012*	*2013*	*2014*	*2015*
Santa Fe Canal-Skeleton	1 – Doppler	+/- 5%	$29,000	X				
Garzas Creek	1– Doppler	+/- 5%	$29,000	X				
Santa Fe Canal –Hwy 165	1 – Doppler	+/- 5%	$29,000	X				
Santa Fe Canal –Below X-CH	1 – Doppler	+/- 5%	$29,000	X				
Mosquito Ditch	1 – Doppler	+/- 5%	$29,000	X				
S. Grassland Reservoir	2 – Doppler 2 – Mag	+/- 5%	$75,000	X				

4. *Water management coordinator*

Name: Michael Gardner Title: Water Master

Address: 22759 S Mercey Springs Road, Los Banos, Ca. 93635

Telephone: 209-704-5394 E-mail: mgardner@grasslandwetlands.org

Section I - Exemptible Best Management Practices

Describe the 5-year implementation plan and the proposed 3-year funding budget.

1. *Improve management unit configuration*

Unit name	*Current acres*	*Reason for change*	*Proposed acres*	*Estimated cost (in $1,000s)*		
				2011	*2012*	*2013*
*NGWCWQCP		Water Conservation	7778	700	6,000	50

*North Grasslands Water Conservation and Water Quality Control Project

(GRCD only) Assist customers to improve management unit configurations.
The GRCD works with Ducks Unlimited, California Waterfowl Association, and its landowners to secure funding for habitat improvements through grants.

2. Improve internal distribution system

a. New control structures within distribution system

Proposed location	*Type of structure*	*Reason for new structure*	*Estimated cost (in $1,000s)*		
			2011	*2012*	*2013*
City Gates	Weir & Bridge	Improved Delivery		150	
SL-1	Concrete Weir	Improved Delivery		150	
Agatha @ SFC	Pipe Replacement	Improved Delivery	10		
Agatha @ Mallard	Pipe Replacement	Improved Delivery	10		
Rubino Ditch	Weir Replacement	Improved Delivery	20		
14 L&C	Weir Replacement	Improved Delivery	20		

b. Line/pipe sections of distribution system

Proposed reach/sect.	*Reason for new structure*	*Estimated cost (in $1,000s)*		
		2011	*2012*	*2013*
None				

Pipelines are not in the District's immediate plans. There is a direct habitat benefit in maintaining open, unlined delivery systems in that they provide additional habitat to a variety of wildlife. In dry summer months, open canals and ditches are sometimes the only source of deep water available to brooding waterfowl and provide their only means of escape from predators. Nevertheless, certain conditions may warrant the installation of pipelines as a part of future projects. For example, if construction of an open ditch would interfere with access or if it was predetermined that extreme seepage losses would occur, the District would consider installing pipelines.

c. Independent water control for each unit

Each unit, private land owner or refuge, is required to maintain their own independent water control system, however the District has at times made these types of improvements. An example would be the District replacing a major water control structure within its canal system and moving or installing a new structure for the landowner as part of the project. These types of changes are usually done to improve water delivery and efficiency.

The District has only a few units that do not have independent water control structures. The long-term goal of the District is to ultimately provide independent systems for all units. The District is always striving to extend delivery systems to accomplish this goal. Because the extension of facilities requires easements from one or more landowners, who may not directly benefit from the project, it sometimes proves difficult to accomplish these goals.

Proposed control point	*Reason for new control point*	*Estimated cost (in $1,000s)*		
		2011	*2012*	*2013*
NA				

d. New internal distribution sections (pipe, canal) to provide water to existing and new habitat units

Proposed new section	*Units served*	*Reason for new section*	*Estimated cost (in $1,000s)*		
			2011	*2012*	*2013*
NA					

(GRCD only) Provide assistance to member units to improve internal distribution
The GRCD provides technical assistance to its landowners for the purpose of correctly sizing water control structures.

Develop a Water Use Schedule

Plan element	*Completion date*	*Estimated development/update cost (in $1,000s)*		
		2011	*2012*	*2013*
Floodup dates by unit		2	2	2
Drawdown dates by unit		NA	NA	NA
Irrigation dates by unit		2	2	2

4. Plan to measure outflow
Identify locations, prioritize, determine best measurement method/cost, submit funding proposal

	Estimated cost (in $1,000s)		
	2011	*2012*	*2013*
Identify locations	X		
Estimate outflow quantity/rank	X		
Develop plan	X		
Estimate construction start date		X	
Estimate construction completion date		X	

5. (GRCD only) Incentive pricing

The District does not have an incentive pricing structure applied to its water delivery. The District controls water efficiency by monitoring intake and drainage areas. The District has been working on refinement of water delivery to individual customers for the sole purpose of improving water efficiency. Monitoring and recording water delivery to a private unit can prove to be the most efficient method of controlling customer discharge throughout the year. The District charges $4/AF for it's Level 4 supply and $21.75/Acre for it's Level 2 supply.

6. Construct and operate operational loss recovery systems

Proposed location	*Reason for improvement*	*Estimated cost (in $1,000s)*		
		2011	*2012*	*2013*
N. Grasslands	Water Conservation	700	6,000	50

Many of the drainage subareas currently flow through other conveyance and wetland unit areas. The entire southern portion of the District (20,538 acres) flows into the Santa Fe Canal. These flows can be mixed with deliveries from the San Luis Canal and the Cross Channel to dilute salts and constituents and reused in the northern portion of the District.

The District has recently entered a cooperative agreement with BOR to initiate a feasibility study for a proposed water conservation and water quality control project to be located on the northern portion of the District. Based on the findings of the project feasibility assessment report the District will work with BOR to develop additional funding to implement this project. This project could result in the reuse of approximatly 8,000 acre feet of water annually.

7. *Optimize conjunctive use of surface and groundwater*

Proposed production/injection well	*Anticipated yield*	*Estimated cost (in $1,000s)*		
		2011	*2012*	*2013*
Rehabilitation of Existing Wells (5)	4,500 af/yr	1,000		
New Wells (6)	5,400 af/yr	300	700	

The District is currently in a Groundwater Acquisition Agreement with Reclamation, to acquire up to 10,000 acre-feet of groundwater per year, through December 31, 2011 at which time may be extended based upon the results of the pilot projects water quality monitoring.

8. *Facilitate use of available recycled urban wastewater that otherwise would not be used beneficially, meets all health and safety criteria, and does not cause harm to wildlife management goals.*

Opportunities for using recycled urban wastewater currently do not exist for the district.

9. *Mapping*

GIS map layers	*Estimated cost (in $1,000s)*		
	2011	*2012*	*2013*
Map 1 – Distribution System	5	5	5
Map 2 – Drainage System	5	5	5
Map 3 – Habitat Types	5	5	5

10. *CALFED Quantifiable Objectives*

Describe any past, present, or future plans that address the goals identified for this Resource Conservation District If reducing nonproductive ET involves removing invasive plants, complete the following:

Invasive unwanted species name	Estimated acres	*Estimated cost (in $1,000s)*

	2011	*2012*	*2013*	*2011*	*2012*	*2013*
Water Hyacinth	80	80	80	20	20	20
Water Primrose	80	80	80	20	20	20
South American Sponge Plant	80	80	80	20	20	20

San Luis NWR, Grassland Resource Conservation District

1. *Describe actions that reduce salinity in the San Joaquin River, Grassland Marshes and Mud and Salt Sloughs. (TB 95, 96, 98)*

The potential for the reduction of salinity load released from the wetland complex to the San Joaquin River is limited. The productivity of the wetland complex is dependent on a cycle of flooding, maintenance flows and drainage to flush salts imported by supplies to maintain soil salt concentrations conducive to beneficial vegetation productivity is presently being studied by the District. The District, in cooperation with the State Water Resource Control Board, CALFED Bay Delta ERP, the California Department of Fish and Game, the Department of Water Resources, UC Davis, and UC Merced investigated Wetland Response to Adaptive Salinity Drainage Management. This investigation found significant degradation in both seed and biomass production in response to a delayed draw drown of seasonal wetlands focused on matching assimilative capacity in the San Joaquin when implemented for two consecutive years. Additionally, the district is currently in a cooperative agreement with Reclamation, in cooperation with the DFG and the U.S. Fish and Wildlife Service to characterize flow and water quality entering, translocation within, and leaving the wetland complex. Preliminary finding indicate that the majority of salt loading to the river from the wetland complex is associated with winter storm events and not wetland draw down. The Real Time Water Quality Network and the aforementioned flow and water quality assessment has fostered the development of a Decision Support System allowing water and wetland mangers to maximize water quality through the mixing of flows from drainage subareas of variable water quality and with CVP supplies. This network also allows managers to minimize operational spill by reducing supply deliveries ultimately saving water for use at other times. Accurate flow measurements now insure that deliveries are accurate and accounted for. Additionally, development of water and salt balances at the impoundment level will facilitate the establishment of regional wetland water requirements and models describing the transport of salt through the wetland complex and the characterization of drainage subareas.

2. *Describe actions that reduce salinity in the Grassland Marshes and Mud and Salt Sloughs. (TB 102, 103, 104*) *(All of these six contaminant TBs could be incorporated into one* Resource *Conservation District manager response, e.g. addressed through the Grassland Drainage Program.*

The removal of salts imported to this area would have the most pronounced effect on salinity reduction. The most obvious method of reducing the amount of salt imported into the area would be to replace the water imported from the Delta with cleaner water from the eastside of the valley. (See previous section for Water Quality Decision Support through the RTWQMN).

3. *Describe actions that reduce nonproductive ET. (TB 107)*

How the District moves water can produce beneficial results in achieving a reduction in the amount of water lost to Evapotranspiration (ET_O). Timing of water deliveries is part of the District's operation plan that helps promote water conservation. Also, the use of aquatic herbicides to control invasive aquatic

plants has a huge positive effect on reducing water losses. Clean, vegetation-free canals allow for a quicker, more efficient delivery of water. Vegetation control within the private management units requires cooperation between District and landowners. The District has had success with consulting and advising private landowners on which plants to avoid and/or remove from their property. The District also advises landowners on which herbicides are effective and how to best manage invasive plants. The District also has, as a part of its water delivery policy, a requirement that all clubs must maintain intake structures and intake delivery waterways free of vegetation that will impair the flow of water and thereby contribute to undue water losses.

Section J - BMP Exemption Requests

For each BMP for which the refuge is seeking an exemption, provide a detailed narrative and complete the summary table

Summary of BMP exemptions

BMP	*Constraint*[1]	*Outstanding Need*[2]
		N/A

1. *Constraint – list existing constraint. Use additional rows for multiple BMPs or constraints. Identify Legal (L), Environmental (EN), or Economic (EC) issues using code. If the BMP is not seen as beneficial, provide detailed information*
2. *Outstanding need – identify assistance required to implement the BMP. State specific funding or other assistance required*

Provide a detailed exemption request below for each BMP listed in the summary table

Non-Applicability (N/A) of Exemptible BMPs

To establish that a BMP is not applicable to the Refuge, the Plan should explain the reasons why the BMP does not apply to the Refuge. This justification must be consistent with Section A of the Criteria titled, "Background." Examples of non-applicability for each exemptible BMP are listed below. This list is not all-inclusive.

Section I, B. Exemptible Best Management Practices

2. *Improve the Distribution System*
   b. Line/pipe sections of distribution system
   N/A if the Current system can distribute water effectively with regular maintenance and on-going improvements to open channels – thus maximizing habitat.

3. *Construct and operate operational loss recovery systems*
   The District has recently entered a cooperative agreement with BOR to initiate a feasibility study for a proposed water conservation and water quality control project to be located on the northern portion of the District. Based on the findings of the project feasibility assessment report the District will work with BOR to develop additional funding to implement this project. This project could result in the reuse of approximately 8,000 acre feet of water annually.

4. *Optimize conjunctive use of surface and groundwater N/A*

The District is currently in a Groundwater Acquisition Pilot Program with Reclamation through December 31, 2011 at which time may be extended based upon the results of the pilot projects water quality monitoring efforts. The ongoing ground water monitoring continues to characterize the effects of pumping on surface water quality. Responsive upstream surface water management continues to minimize downstream surface water degradation and maintain compliance below water quality objectives for the wetland complex.

5. *Facilitate use of available recycled urban wastewater that otherwise would not be used beneficially, meets all health and safety criteria, and does not cause harm to wildlife management goals.*

   N/A: there is currently no recycled urban wastewater available for the District to utilize

Data, including estimated habitat acreages and water requirements for optimal production and maintenance, included in this document and associated tables are referenced from the San Joaquin Basin Action Plan/Kesterson Mitigation Plan Report (1989) and Report on Refuge Water Supply Investigations (1989), developed by the Bureau of Reclamation, Fish and Wildlife Service, and the Department of Fish and Game. Precipitation data was drawn from local weather stations and may be unrepresentative given the expansive distribution of the CVPIA wetlands. Evaporation and seepage data were derived from gross estimates and are unrepresentative of actual conditions given the high variability in vegetation and soil type. Furthermore, estimated applied acre feet per wetland acre data was calculated based on the aforementioned assumptions and water delivery estimates. Given the inherent numerous assumptions utilized to generate the data included in this document and associated tables, this information is not intended for any other purpose and should not be used without the written consent of the author agencies.

Table 1

Water Supply Delivered to Refuge Boundary

2009	Federal Wtr Level 2 (acre-feet)	Federal Wtr Level 4 (acre-feet)	Local Water Supply (acre-feet)	Groundwtr (acre-feet)	Up Slope Water (acre-feet)	Other Carryover (acre-feet)	Total (acre-feet)
Method	**M-2**	**M-2**		**M-2**		**M-2**	
Jan-2010	349	0	0	1,291	0	0	**1,640**
February	12,538	1,000	0	465	0	0	**14,003**
Mar-2009	0	0	0	0	0	0	**0**
April	0	941	0	0	0	2,424	**3,365**
May	7,404	1,260	0	404	0	0	**9,068**
June	2,399	1,999	0	400	0	0	**4,798**
July	100	543	0	350	0	0	**993**
August	1,333	360	0	278	0	0	**1,971**
September	53,574	1,588	0	1,153	0	0	**56,315**
October	42,493	1,475	0	1,407	0	0	**45,375**
November	6,487	2,569	0	1,222	0	0	**10,278**
December	325	0	0	1,789	0	0	**2,114**
TOTAL	**127,002**	**11,735**	**0**	**8,759**	**0**	**2,424**	**149,920**

***March 1, 2009 - February 28, 2010**

Measurement Method Definiti	
M1	Measured sum
M2	Measured sum
M3	Measured sum
C1	Calculated (mc
C2	Calculated usi
C3	Calculated usi
E1	Estimated usin
E2	Estimated usin
E3	Estimated usin
O1	Other (attach a

Table 2

Internal Distribution System

Year	2009								
Canal, lateral	**Length (feet)**	**Width (feet)**	**Surface Area (square feet)**	**Precip. (acre-feet)**	**Evaporation (acre-feet)**	**Seepage (acre-feet)**	**Operational losses (acre-feet)**	**Measure method see Cell K5**	**Total (acre-feet)**
San Luis Canal	84,216	50	4,210,800	80.15	459.49	3,046	0	M2	**(3,425)**
Cross Channel	9,240	60	554,400	10.55	60.50	3,427	0	M2	**(3,477)**
Mosquito Ditch	13,200	40	528,000	10.05	57.62	1,035	0	M2	**(1,082)**
Malia Ditch	8,976	30	269,280	5.13	29.38	686	0	M2	**(710)**
Garzas Creek	5,280	40	211,200	4.02	23.05	2,625	0	M2	**(2,644)**
Los Banos Creek	5,280	60	316,800	6.03	34.57	979	0	M2	**(1,008)**
Cottonwood Lat	10,560	15	158,400	3.02	17.28	437	0	M2	**(451)**
Almond Drive	34,320	25	858,000	16.33	93.63	2,696	0	M2	**(2,774)**
Ascot Ditch	10,560	15	158,400	3.02	17.28	378	0	M2	**(393)**
Bayshore Ditch	5,280	10	52,800	1.01	5.76	244	0	M2	**(249)**
Cook Ditch	10,560	15	158,400	3.02	17.28	141	0	M2	**(155)**
Camp 13	44,880	50	2,244,000	42.71	244.87	5,731	0	M2	**(5,933)**
Helm First Point	17,952	50	897,600	17.09	97.95	1,072	0	M2	**(1,153)**
Meyers Ditch	5,280	15	79,200	1.51	8.64	456	0	M2	**(463)**
Agatha Canal	63,888	50	3,194,400	60.81	348.58	5,769	0	M2	**(6,056)**
Gables Ditch	10,560	30	316,800	6.03	34.57	328	0	M2	**(356)**
Branch 3	7,920	30	237,600	4.52	25.93	461	0	M2	**(483)**
TOTAL	**347,952**		**14,446,080**	**275**	**1,576**	**29,510**	**0**		**(30,812)**
			332	**acres**					

The seepage number is an rough estimate of 19%. See section 3B4 for details

Table 3

Managed Lands Water Applied

Year	2009									
Habitat Type		**Area (habitat acres)	*Habitat Water (AF/ac)	**AF/ac water (AF/ac)	Delivered Water (Total AF)	Precip (AF/Ac)	Shallow Groundwtr (AF/Ac)	Evap (AF/Ac)	*Cultural Practices (AF/Ac)	*Seepage (AF/Ac)
Seasonal wetlands: timothy		30,800	5.00	2.36	72,688	0.73	0.00	1.63	1.50	1.25
Seasonal wetlands: smartweed		1,600	6.00	4.50	7,200	0.79	0.00	2.81	1.50	1.50
Seasonal wetlands: watergrass		3,200	8.00	5.00	16,000	0.79	0.00	2.81	1.50	2.00
Permanent wetlands		1,200	12.00	6.00	7,200	0.83	0.00	4.75	3.00	3.00
Semi-perm wetlands/brood pond		1,200	10.00	7.00	8,400	0.83	0.00	4.75	2.00	2.50
Riparian		1,200	12.00	5.00	6,000	0.79	0.00	2.81	1.50	1.00
Irrigated pasture		800	5.00	2.00	1,600	4.40	0.00	4.17	0.00	1.25
Upland		18,000	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00
(define)					0	0.00	0.00	0.00	0.00	0.00
(define)					0	0.00	0.00	0.00	0.00	0.00
Total Habitat Acres		**58,000**	**4.03**	**2.05**	**119,088**					

***The Habitat Water Needs (AF/ac), Cultural Practices, and Seepage numbers are estimates by DFG and should not be used for any other purpose.**

****The Water "Applied" (AF/ac), and Area Habitat Acres are estimates and should not be used to any other purposes.**

Table 4

GRCD Water Inventory

Year	2009	Reference		
Total Water Supply		**Table 1**		149,920
Precipitation		**Table 2**	**plus**	275
Evaporation		**Table 2**	**minus**	1,576
Seepage		**Table 2**	**minus**	29,510
Operational Losses		**Table 2**	**minus**	0
		Deliveries to Managed Lands		119,108
Managed Land needs		**Table 3**	**minus**	234,000
Difference		**(calculated)**		(114,892)
		Balance (outflow?) (Table 3)		(47,285)
		Water Inventory Balance		(162,177)

Table 5

Annual Water Quantities Delivered Under Each Right or Contract

Year	Federal Wtr Level 2 (acre-feet)	Federal Wtr Level 4 (acre-feet)	Local Water Supply (acre-feet)	Groundwtr (acre-feet)	Up Slope Water (acre-feet)	CarryOver (acre-feet)	Total (acre-feet)
2001	125,000	32,368	0	0	0	0	**157,368**
2002	125,000	48,075	0	0	0	0	**173,075**
2003	125,000	42,869	0	0	0	4,700	**172,569**
2004	125,000	42,210	0	0	0	2,673	**169,883**
2005	125,000	46,386	0	0	0	5,000	**176,386**
2006	125,000	55,000	0	0	0	0	**180,000**
2007	125,000	24,120	0	0	0	0	**149,120**
2008	125,000	16,263	0	2,037	0	0	**143,300**
2009	125,000	12,458	0	8,759	0	3,703	**149,920**
2010	125,000	38,004	0	4,944	0	2,077	**170,025**
Total	**1,250,000**	**357,753**	**0**	**15,740**	**0**	**18,153**	**1,641,646**
Average	**125,000**	**35,775**	**0**	**1,574**	**0**	**1,815**	**164,165**

RESOLUTION OF THE BOARD OF DIRECTORS
OF THE
GRASSLAND WATER DISTRICT

NO. 2011-05

AUTHORIZING SUBMISSION OF THE GRASSLAND WATER DISTRICT WATER MANAGEMENT PLAN

WHEREAS, the GRASSLAND WATER DISTRICT ("DISTRICT") entered into Contract No. 01-WC-20-1754 dated January 19, 2001 with the U.S. DEPARTMENT OF THE INTERIOR ("DOI") for WATER SUPPLY TO LANDS WITHIN THE GRASSLAND RESOURCE CONSERVATION DISTRICT ("WATER SUPPLY CONTRACT"), and

WHEREAS, Article 17 of the WATER SUPPLY CONTRACT provides, in part, that the DISTRICT shall prepare a "wetland habitat water management plan in order to ensure the effective use of water supplies to meet wetland resource needs...", and further provides that the water management plan shall be submitted to the DOI Contracting Officer for review, and

WHEREAS, the WATER SUPPLY CONTRACT also provides that preparation of the water management plan shall be governed by criteria developed by the INTERAGENCY REFUGE WATER MANAGEMENT TEAM ("IRWMT") comprised of representatives of the U.S. BUREAU OF RECLAMATION, THE U.S. FISH AND WILDLIFE SERVICE, THE CALIFORNIA DEPARTMENT OF FISH AND GAME and the GRASSLAND WATER DISTRICT, and

WHEREAS, in accordance with Article 17 of the WATER SUPPLY CONTRACT and the criteria developed by the IRWMT and in the broader interest of promoting the effective and efficient use of water, DISTRICT staff has prepared the GRASSLAND WATER DISTRICT WATER MANAGEMENT PLAN dated DECEMBER 31, 2010, attached hereto as Exhibit A.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the GRASSLAND WATER DISTRICT that the General Manager is hereby authorized to submit the GRASSLAND WATER DISTRICT WATER MANAGEMENT PLAN dated DECEMBER 31, 2010 to the DOI Contracting Officer as required by the WATER SUPPLY CONTRACT.

APPROVED AND ADOPTED the 9th day of August, 2011 by the GRASSLAND WATER DISTRICT.

AYES: Medford "Pepper" Snyder, Doug Federighi, Bob Nardi, Tom Mackey

NOES: None

ABSENT: Byron Hisey

ABSTAIN: None

VACANCY: None

GRASSLAND WATER DISTRICT

By_____
PEPPER SNYDER, President

By_____
DAVID WIDELL, Secretary